Hong Kong Registry Report 2004

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This report is based on data (up to 31 March 2004) from the Renal Registry of the Hospital Authority of Hong Kong, and accounts for 90–95% of all patients receiving renal replacement therapy (RRT) in the territory. Patients receiving RRT in the private sector are not included in this report.

The number of patients receiving RRT was 6,054 (889 per million population [pmp]), of whom 51.6% (3,123, 451 pmp) were receiving peritoneal dialysis (PD), 10.9% (662, 97 pmp) hemodialysis (HD), and 37.5% (2,269, 334 pmp) had functioning kidney transplants. The net increase from the previous year in the number of patients receiving RRT was 3.1%. The incidence of end-stage renal failure in patients undergoing RRT was 954 (140 pmp). The median ages of existing and new patients receiving RRT were 55 and 56 years, respectively. There was a trend towards an increasing number of elderly dialysis patients. Diabetes was the third major cause of renal failure among existing RRT patients and the most common cause of renal failure in new cases. The rate of serologic positivity for hepatitis B infection in RRT patients was 9.68%, while that for hepatitis C infection was 3.28%.

In Hong Kong, most patients were put on PD when RRT was required. Of all patients on dialysis, 83% were on PD, of whom 94.8% were on continuous ambulatory peritoneal dialysis (CAPD). Most CAPD patients were on disconnect systems. HD was used in 17.5% of all patients on dialysis. Of the 2,269 patients with functioning kidney transplants, 836 (36.8%) were transplanted in Hong Kong. Of these, 495 (59.2%) had undergone cadaveric kidney transplantation. Of all patients receiving RRT, 30% were receiving erythropoietin.

For the year ending 31 March 2004, the annual crude mortality rate for all RRT was 10% (15.3% for PD, 13% for HD, and 1.9% for transplantation). The major causes of death were infection, cardiovascular disease, and cerebrovascular accident. The 1- and 5-year survival rates for patients with kidney transplantation performed in Hong Kong between 1 April 1997 and 31 March 2003 were 98.6% and 96.5%, respectively, for living related kidney transplants, and 96.1% and 91.2%, respectively, for cadaveric kidney transplants. The 1- and 5-year graft survival rates were 91.1% and 86.1% (death censored) and 90.5% and 85.6% (death not censored) for living related kidney transplants, and 89% and 83% (death censored) and 86% and 79% (death not censored) for cadaveric kidney transplants. The overall peritonitis rate for all chronic PD systems for the year ending 31 March 2004 was one episode per 27.7 months. [*Hong Kong J Nephrol* 2005;7(1):38–46]

Key words: hemodialysis, peritoneal dialysis, renal registry, renal replacement therapy, renal transplantation

本報告是基於香港醫院管理局腎病記錄（截至 2004 年 3 月 31 日）的數據，共涵蓋當地接受腎臟替代療法（RRT）的人口達 90–95%；然而，本報告並不包括在私營院所接受 RRT 的病人。

據統計，接受 RRT 的病人轂數為 6,054 人（889/每一百萬人口[pmp]），其中接受腹膜透析（PD）者佔 51.6%（3,123，451 pmp）；血液透析（HD）佔 10.9%（662，97 pmp）；具功能之腎臟移植則佔 37.5%（2,269，334 pmp）。相比於前一年，RRT 接受者的淨增幅為 3.1%。在 RRT 接受者中，末期腎衰竭的數目為 954（140 pmp）；既有個案及新個案的年齡中位數則分別為 55 及 56 歲；而且，接受 RRT 的

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年老病人數目呈上升的趨勢。對於既有的 RRT 接受者，糖尿病在腎衰竭的成因中排第三位；在新個案中，糖尿病在腎衰竭成因中更排名第一。在整體 RRT 人口中，根據血清測試的結果，B 型肝炎及 C 型肝炎的陽性比率分別為 9.68% 及 3.28%。

香港的 RRT 個案以 PD 為最大宗，數據顯示，在所有接受透析療法的病人中，PD 佔 83%，其中 94.8% 為連續可攜帶式腹膜透析 (CAPD)，大部分為分離式裝置。HD 則佔所有透析的 17.5%。在 2,269 位已接受具功能植入腎臟的病人中，836 人 (36.8%) 在香港接受移植，其中 495 人 (59.2%) 接受屍腎移植。在所有 RRT 的接受者中，有 30% 的病人同時接受 erythropoietin。

截至 2004 年 3 月 31 日的一年內，RRT 的粗死夭率為 10% (PD，15.3%；HD，13%；移植，1.9%)；主要死因包括感染、心血管疾病、及腦血管意外。在 1997 年 4 月 1 日至 2003 年 3 月 31 日期間，香港本土活體親屬腎臟移植的 1- 及 5- 年存活率分別為 98.6% 及 96.5%；屍體腎臟移植的相關比率則分別為 96.1% 及 91.2%。在活體親屬腎臟移植中，植入腎臟的 1- 及 5- 年存活率分別為 91.1% 及 86.1% (排除植入腎臟存活卻死夭的病人) 或 90.5% 及 85.6% (未排除)；屍體腎臟移植的相關比率則分別為 89% 及 83% (排除植入腎臟存活卻死夭的病人) 或 86% 或 79% (未排除)。截至 2004 年 3 月 31 日的一年內，在所有接受長期 PD 的病人中，腹膜炎的整體比率為每 27.7 個月發生一宗。

Introduction

This report is based on data (up to 31 March 2004) from the Renal Registry of the Hospital Authority (HA) of Hong Kong, and accounts for 90–95% of all patients receiving renal replacement therapy (RRT) in the territory. There are 11 renal units, four satellite centers and four major renal transplant centers in Hong Kong. Patients receiving RRT in the private sector are not included in this report.

Hong Kong Renal Registry/Clinical Information System

The Renal Registry, implemented by the HA of Hong Kong on 1 April 1995, is a direct, online, computerized registry. Computer terminals are installed in all the renal units operated by the HA and are linked by a cable network system to a central database at the HA head office. Data are entered directly into the local computer terminals and are stored in servers in the HA head office. There is no need to manually complete annual report forms. As a computerized clinical information system, individual renal units can use the Renal Registry as a database for clinical management. The data entered can be directly analyzed online. The Renal Registry also allows the HA head office to compile a registry report for the whole territory of Hong Kong.

The Renal Registry is linked with other related computerized systems. It allows automatic download of the following information: a donor's data from the "Organ Procurement System" used by transplant coordinators; and individual human leukocyte antigen data from the "Tissue Typing Laboratory System". The registry is the platform for fair cadaveric kidney allocation by providing computer-generated scores for potential recipients.

Prevalence and Incidence

The number of patients receiving RRT on 31 March 2004 was 6,054, with a prevalence of 889 per million population (pmp), and an incidence of 140 pmp. In the 12 months ending 31 March 2004, 954 new patients started RRT; this was an increase of 188 patients from the previous 12-month period. Among the patients receiving RRT, 3,123 (51.6%) were receiving peritoneal dialysis (PD), 662 (10.9%) hemodialysis (HD), and 2,269 (37.5%) were living with a functioning graft. Among dialysis patients, 82.5% were undergoing PD, and 17.5% HD.

From 1996–2004, an increasing trend in the prevalence of RRT was noted, although the rate of increase was reduced (Figure 1). The net reduction in the increase appeared more dramatic in the year 2003–2004, when Hong Kong was affected by severe acute respiratory syndrome (SARS) and the incidence of RRT actually dropped, not because of a change in the population, but possibly because patients avoided hospitals and seeking active treatment during the SARS period. Changes were noted in the proportion of patients undergoing the various forms of RRT: the rate of increase in PD slowed gradually, whereas the number of patients with functioning renal allografts increased

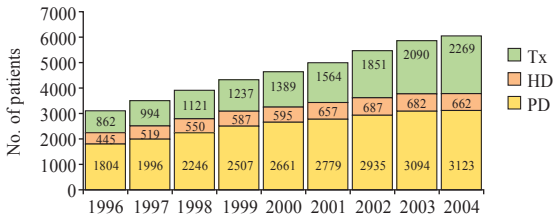


Figure 1. Trends in the prevalence of renal replacement therapy (as of 31 March each year). PD = peritoneal dialysis; HD = hemodialysis; Tx = transplantation.

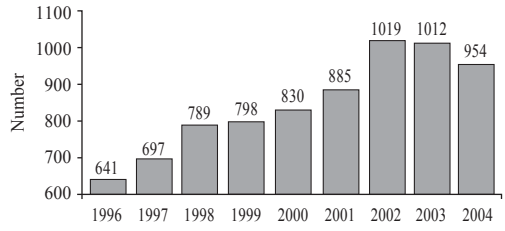


Figure 2. Incidence of renal replacement therapy (as of 31 March each year).

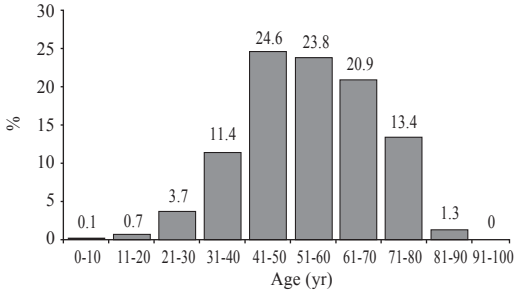


Figure 3. Percentage age distribution for existing renal replacement therapy recipients (as of 31 March 2004).

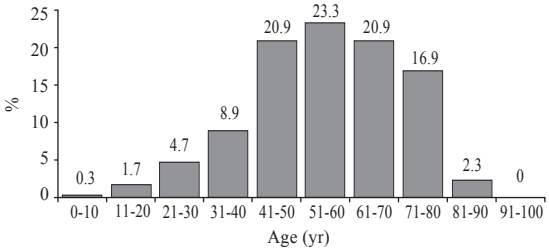


Figure 4. Percentage age distribution for new renal replacement therapy recipients (for year ending 31 March 2004).

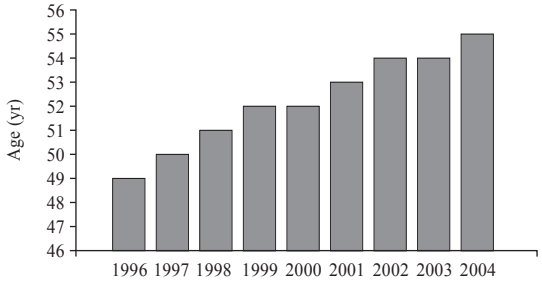


Figure 5. Median age of existing renal replacement therapy recipients (as of 31 March each year).

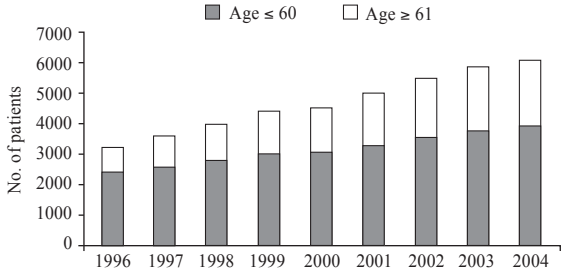


Figure 6. Trends in the age of existing renal replacement therapy recipients (as of 31 March each year).

steadily (Figure 1). Clearly, the proportion of patients on transplant treatment increased. However, the total number of patients also increased, although this increase was slowed by SARS in the year ending 31 March 2004. The incidence of RRT (Figure 2) appeared to reach a plateau at around 1,000–1,020 cases (147–150 pmp) per year, although the figure for the year ending 31 March 2004 was probably affected by the SARS epidemic.

Demographic Data

Age

For the year ending 31 March 2004, the median age of patients receiving RRT was 55 years: 35.6% of patients were aged > 60 years, 20.9% were in their sixties, and 14.7% were aged > 70 years (Figure 3). For new RRT patients, the median age was 56 years: 40.1% of new patients were aged > 60 years, 20.9% were in their sixties, and 19.2% were aged > 70 years (Figure 4). Thus, an increasing number of elderly patients were receiving RRT.

From 1996–2004, there was an increase in the median age of existing RRT recipients from 49 to 55 years (Figure 5). There was also a trend towards an increasing proportion of RRT recipients aged > 60 years (Figure 6). A similar trend was observed in new RRT recipients, with median age increasing from 54 to 56 years. For the year ending 31 March 2004, the proportion of elderly, new RRT recipients had declined, but again, this may have been related to the SARS epidemic (Figure 7).

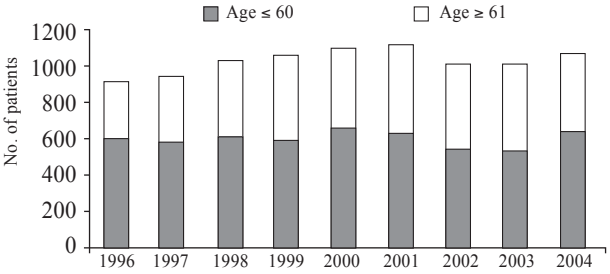


Figure 7. Trends in the age of new renal replacement therapy recipients (as of 31 March each year).

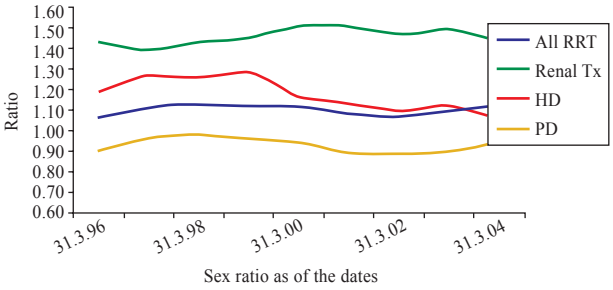


Figure 8. Male:female ratio among patients receiving different types of renal replacement therapy (RRT) (as of 31 March each year). Tx = transplantation; HD = hemodialysis; PD = peritoneal dialysis.

Gender

The male:female (M:F) ratios of patients with functioning renal allografts or on HD or PD from 1996 to 2004 are shown in Figure 8. There were variations in the gender distribution of patients according to the three different types of RRT. The overall M:F ratio (as of 31 March 2004) for patients on RRT was 1:1.12, that for patients who had undergone renal transplantation was 1.44:1, that for patients on HD was 1.07:1, and that for patients on PD was 0.95:1.

Among transplant recipients during the last 5–6 years, the M:F ratio was relatively constant. More male than female patients had functioning renal allografts. More than 60% of patients underwent renal transplantation outside the Hong Kong Special Administrative Region (SAR); thus, the male preponderance was probably the result of more men than women going to China for renal transplantation.

There was a trend towards more male than female patients undergoing HD in the last 5–6 years; however, the ratio decreased over this period and approached unity in the year ending 31 March 2004.

There were fewer male than female patients maintained on PD. To some extent, this may have been because more male than female patients underwent renal transplantation.

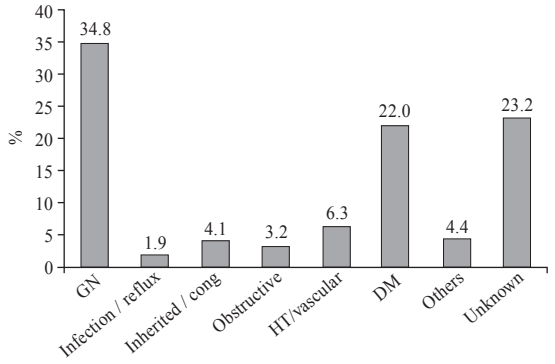


Figure 9. Primary renal disease leading to end-stage renal disease in patients receiving any form of renal replacement therapy (as of 31 March 2004). GN = glomerulonephritis; cong = congenital; HT = hypertension; DM = diabetes mellitus.

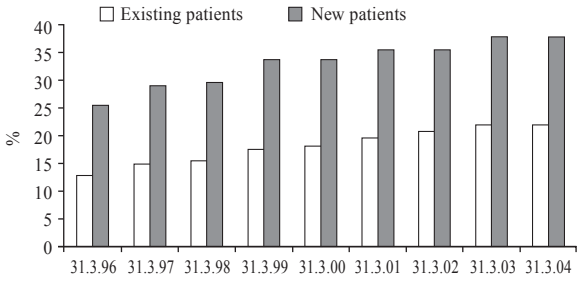


Figure 10. Diabetic nephropathy leading to end-stage renal disease in patients receiving any form of renal replacement therapy (as of 31 March each year).

Primary renal disease

For existing patients receiving RRT, glomerulonephritis (GN) was the most common cause of renal failure (34.8% of patients), whereas "unknown" causes and diabetes mellitus were ranked second and third, respectively (Figure 9).

The prevalence of diabetic nephropathy increased from 13% in 1996 to 22% in 2004. The number of new patients presenting with diabetic nephropathy increased from 25.3% in 1996 to 38.0% in 2004 (Figure 10). Thus, the trend was increasing, although the rate of increase appeared to slow down.

Regarding the different types of GN leading to end-stage renal disease (ESRD) in existing RRT recipients on 31 March 2004, 53.4% of GN cases were primary GN, 9.8% were secondary GN (excluding diabetic nephropathy), 5.2% were advanced sclerosing GN, and 31.6% were suspected GN not proven by biopsy. Biopsy-proven primary GN was identified as immunoglobulin-A nephropathy (60.8% of cases), focal segmental glomerulosclerosis (12.7%), mesangial-capillary GN (5.3%), membranous GN (5.1%),

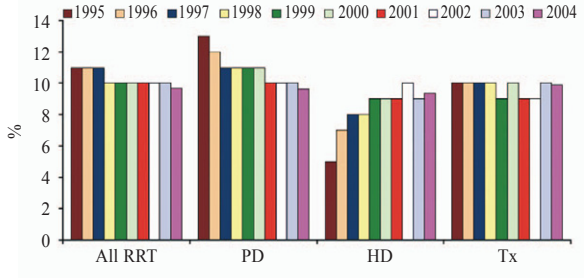


Figure 11. Prevalence of hepatitis B virus infection among renal replacement therapy (RRT) recipients (as of 31 March each year). PD = peritoneal dialysis; HD = hemodialysis; Tx = transplantation.

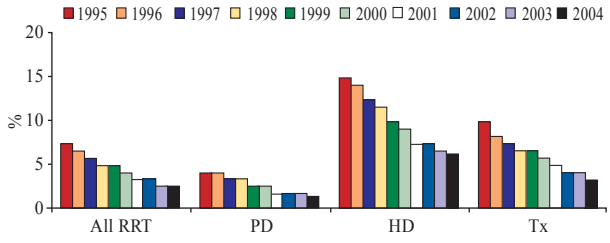


Figure 12. Prevalence of hepatitis C virus infection among renal replacement therapy (RRT) recipients (as of 31 March each year). PD = peritoneal dialysis; HD = hemodialysis; Tx = transplantation.

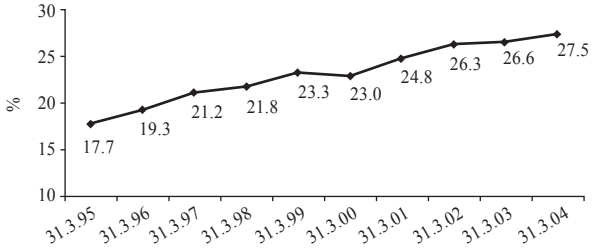


Figure 13. Prevalence of diabetes mellitus among renal replacement therapy recipients (as of 31 March each year).

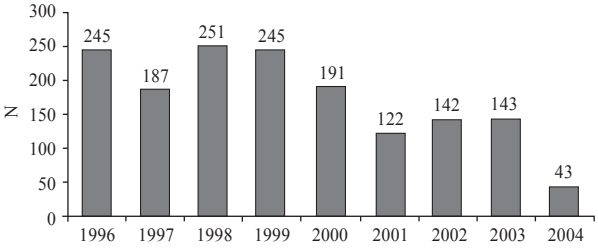


Figure 14. Net increase in peritoneal dialysis patients (years ending 31 March, 1996–2004).

crescentic GN (4.8%), and other miscellaneous GNs (11.3%). The main cause of secondary GN was systemic lupus erythematosus (79.7% of cases).

Comorbid risk factors

Hepatitis B and C infection

As of 31 March 2004, 9.8% of all patients receiving RRT were serologically positive for hepatitis B virus (HBV) infection (PD, 9.6%; HD, 9.4%; transplantation, 9.9%). The prevalence of HBV carrier status among RRT recipients remained steady during the past 5 years, although the prevalence among PD patients appeared to decrease (Figure 11).

Among all RRT recipients, 3.28% had hepatitis C virus (HCV) infection (PD, 1.8%; HD, 7.6%; transplantation, 4.2%). Trends for HCV infection during the past 10 years are shown in Figure 12. The prevalence of HCV infection decreased among HD and transplant patients, but remained static in PD patients, during the past 4 years.

Diabetes mellitus

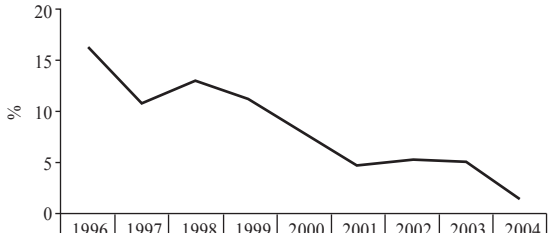
When diabetes mellitus was counted as comorbidity, on 31 March 2004, 27.5% of all RRT recipients were diabetics (PD, 38.5%; HD, 22.7%; transplantation, 12.2%). The growing trend towards an increased number of RRT recipients with diabetes is shown in Figure 13. The increasing prevalence of diabetes in the general population is also reflected in patients receiving RRT, and such prevalence in the general population continues to increase.

Renal Replacement Therapy

Peritoneal dialysis (PD)

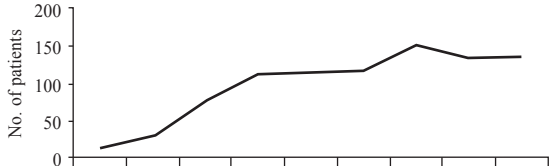
All new patients requiring RRT were started on PD unless contraindicated or unless pre-emptive renal transplantation had been arranged. Most renal transplantations were performed outside the Hong Kong SAR. The funding for dialysis fluid was mainly supported by the HA.

Among RRT recipients, 62.5% were undergoing dialysis therapy. Among the latter patients, 82.5% were on PD (i.e. 51.6% of patients requiring RRT were on PD). As of 31 March 2004, 3,069 patients were maintained on PD (459 pmp), and among these, 2,909 (94.8%) were receiving continuous ambulatory peritoneal dialysis (CAPD), and 135 (4.4%) were receiving automated PD (APD), i.e. night intermittent peritoneal dialysis or continuous cyclic peritoneal dialysis. The remaining patients were on intermittent PD in hospital or at home. The net increase from the previous year in the number of patients maintained on PD was 43 (+1.4%). This was exceptionally low when compared with figures from previous years (Figure 14),



	1996	1997	1998	1999	2000	2001	2002	2003	2004
— % Change	16.3	10.7	13.0	11.2	7.9	4.7	5.2	5.0	1.4

Figure 15. Percentage net growth in peritoneal dialysis patients (years ending 31 March, 1996–2004).



	1996	1997	1998	1999	2000	2001	2002	2003	2004
— APD patients	11	28	74	111	112	117	150	134	135

Figure 16. Number of automated peritoneal dialysis (APD) patients (years ending 31 March, 1996–2004).

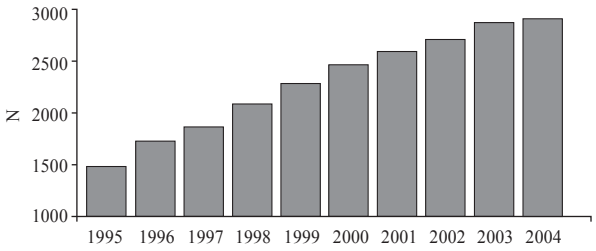


Figure 17. Number of continuous ambulatory peritoneal dialysis patients (as of 31 March each year).

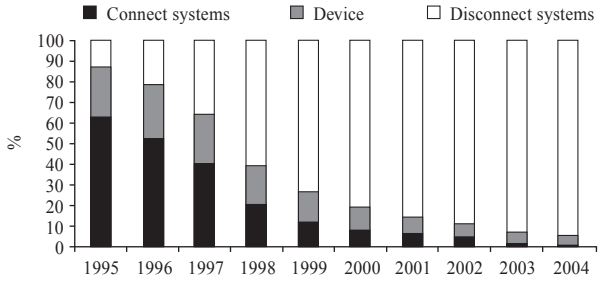


Figure 18. Percentage trends in the use of connecting and disconnecting systems (as of 31 March each year).

and the percentage change is shown in Figure 15. The reduced net growth in PD in the last year (2003–2004) is partly the result of the SARS epidemic and partly related to an increase in pre-emptive transplantation in patients requiring RRT.

There was an increasing trend in the number of patients receiving APD. However, the rate of increase became less in the last 3 years of the analysis period (2001–2004; Figure 16).

Figure 17 shows the trend for CAPD use from 1996 to 2004. There was an increasing trend in the number of CAPD patients, although the rate of increase was reduced in the year ending 31 March 2004.

As of 31 March 2004, most CAPD patients (94.5%) were using disconnecting systems; only 0.83% of patients were using connect systems, and 3.95% required the use of a device (UV Flash™ system; Baxter Healthcare Ltd, Hong Kong SAR, China) for CAPD exchanges. Trends in the use of connecting and disconnecting systems are shown in Figure 18.

Among patients using disconnect systems, 68.5% were using a Baxter Ultrabag® (Baxter Healthcare Ltd), 27.9% were using a Fresenius StaySafe or A.N.D.Y. Disc System (Fresenius Medical Care Asia-Pacific Ltd, Hong Kong SAR, China), 2.8% were using Gambrosol Trio (Gambro China Ltd, Hong Kong SAR, China), and 0.9% were using other systems. Figure 19 shows trends in the use of various connecting systems from 1995–2004.

Hemodialysis (HD)

Most patients commencing HD were switched from other forms of RRT, in particular after failure of PD therapy. Patients receiving regular hemodiafiltration were counted as being on HD in the report. Hospital-based and satellite center-based HD was funded by the Hong Kong government via the HA. Patients were required to pay a small hospital attendance fee. Patients receiving HD at charitable centers paid for their own HD at a subsidized rate. The number of patients receiving HD at private centers was underestimated by the report.

As of 31 March 2004, 662 patients (97 pmp) were on HD, comprising 11.2% of all RRT patients and 17.5% of all dialysis patients. Among these HD patients, 416 (62.8%) were receiving hospital-based HD, 96 (14.5%) satellite center-based HD, 74 (11.2%) charitable center-based HD, and three (0.4%) home HD. There was no net increase from the previous year in the number of patients on HD (Figure 20).

Kidney transplantation

As of 31 March 2004, there were 2,269 patients (334 pmp) with a functioning kidney graft, constituting 37.5% of RRT recipients. Among these 2,269, 836 (36.8%) underwent transplantation in Hong Kong; other renal transplants were performed overseas. Of the transplants performed in Hong Kong, 495 (59.2%) were cadaveric and 341 (40.8%) were from living related

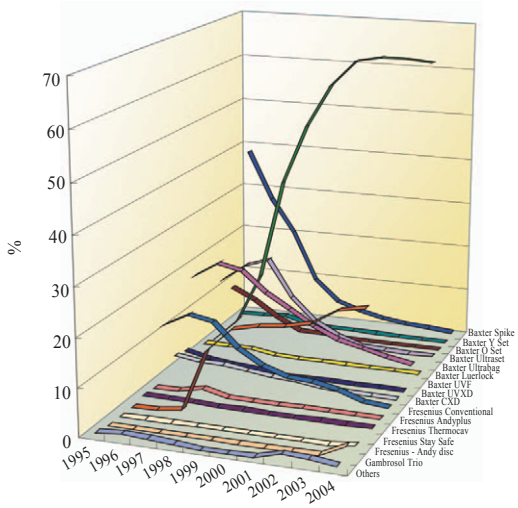
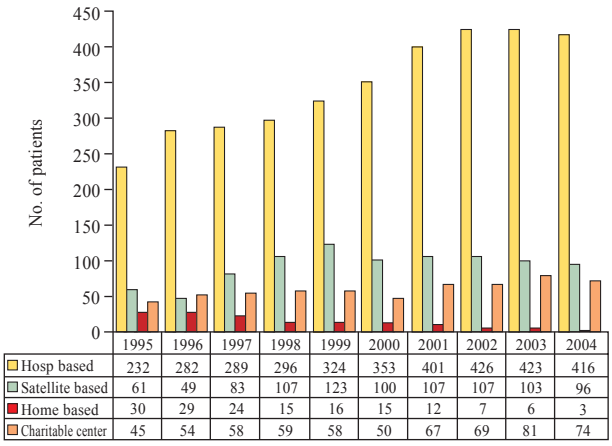


Figure 19. Percentage distribution of connecting and disconnecting systems (1995–2004).



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Hosp based	232	282	289	296	324	353	401	426	423	416
Satellite based	61	49	83	107	123	100	107	107	103	96
Home based	30	29	24	15	16	15	12	7	6	3
Charitable center	45	54	58	59	58	50	67	69	81	74

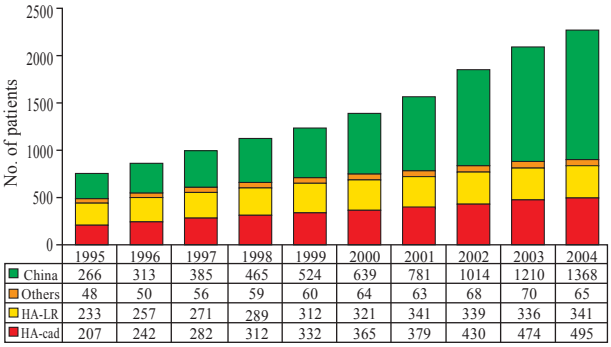
Figure 20. Number of patients on hemodialysis at various locations (as of 31 March each year).

donors. The growing trends in the number of patients undergoing transplantation and in the number of transplants performed at HA hospitals and overseas are shown in Figure 21.

In the year ending 31 March 2004, 247 patients (36.3 pmp) underwent kidney transplantation: 48 transplants were performed in Hong Kong (40 with cadaveric kidneys and eight with living related donor kidneys); and 199 patients underwent transplantation overseas.

Erythropoietin

For the year ending 31 March 2004, 29.5% of all RRT patients (1,123 patients; 165 pmp) received erythropoietin therapy, thus representing an increase of 1% from the previous year. Considerably fewer PD than



	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
China	266	313	385	465	524	639	781	1014	1210	1368
Others	48	50	56	59	60	64	63	68	70	65
HA-LR	233	257	271	289	312	321	341	339	336	341
HA-cad	207	242	282	312	332	365	379	430	474	495

Figure 21. Number of patients with functioning renal allografts: transplantation performed at Hospital Authority (HA) hospitals and overseas. cad = cadaveric; LR = living related donor.

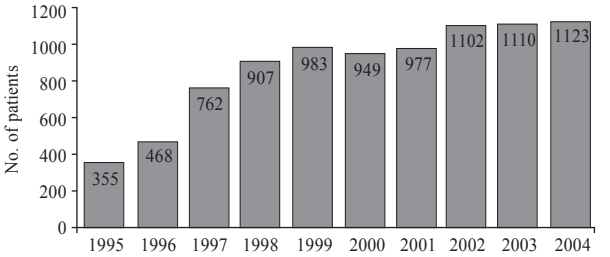


Figure 22. Number of patients receiving erythropoietin (as of 31 March each year).

HD patients were receiving erythropoietin (22.3% vs 61.6%). The growing trend in the number of patients treated with erythropoietin is shown in Figure 22.

Outcomes

Crude mortality rates and causes of death

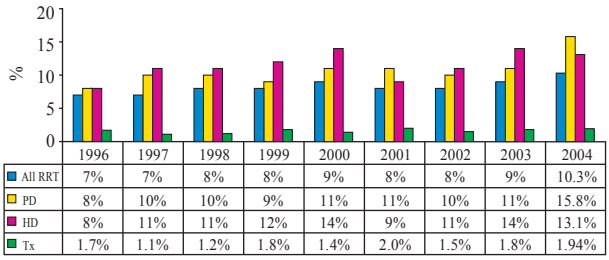
The mortality rate was defined as the rate of death among all patients treated during the period of the report. The annual crude mortality rate for the year ending 31 March 2004 for all types of RRT was 10% (15.3% for PD, 13.1% for HD, and 1.9% for transplantation). Trends in the crude mortality rate are shown in Figure 23.

The main causes of death were infection (30.4% of patients) and cardiovascular disease (28.1%). Percentage trends for the various causes of death in PD, HD and renal transplant patients are shown in Figures 24, 25 and 26, respectively.

Patient survival rates

PD and HD patients

From April 1995 to March 2003, the overall 1-year patient-survival rate for all modes of PD treatment was 95.7%, and the 5-year survival rate was 49.8%. Figure 27 shows the life table plot of overall patient survival



	1996	1997	1998	1999	2000	2001	2002	2003	2004
All RRT	7%	7%	8%	8%	9%	8%	8%	9%	10.3%
PD	8%	10%	10%	9%	11%	11%	10%	11%	15.8%
HD	8%	11%	11%	12%	14%	9%	11%	14%	13.1%
Tx	1.7%	1.1%	1.2%	1.8%	1.4%	2.0%	1.5%	1.8%	1.94%

Figure 23. Trends in annual crude mortality (years ending 31 March, 1996–2004). RRT = renal replacement therapy; PD = peritoneal dialysis; HD = hemodialysis; Tx = transplantation.

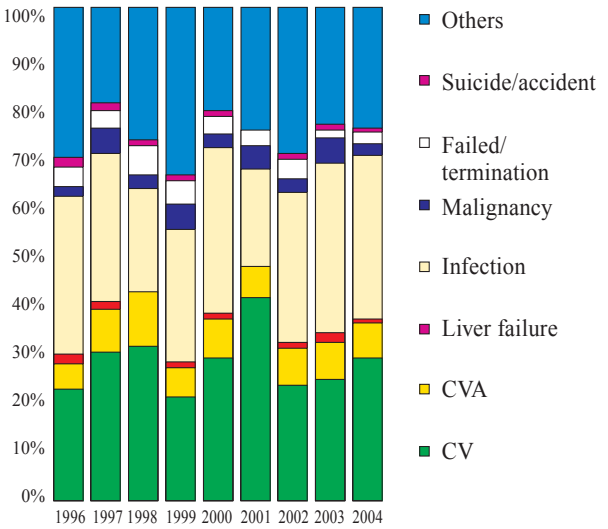


Figure 24. Percentage trends in causes of death in peritoneal dialysis patients (years ending 31 March, 1996–2004). CVA = cerebrovascular accident; CV = cardiovascular disease.

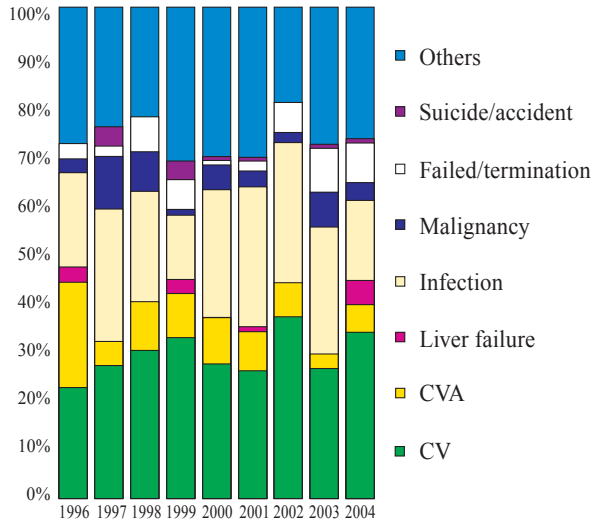


Figure 25. Percentage trends in causes of death in hemodialysis patients (years ending 31 March, 1996–2004). CVA = cerebrovascular accident; CV = cardiovascular disease.

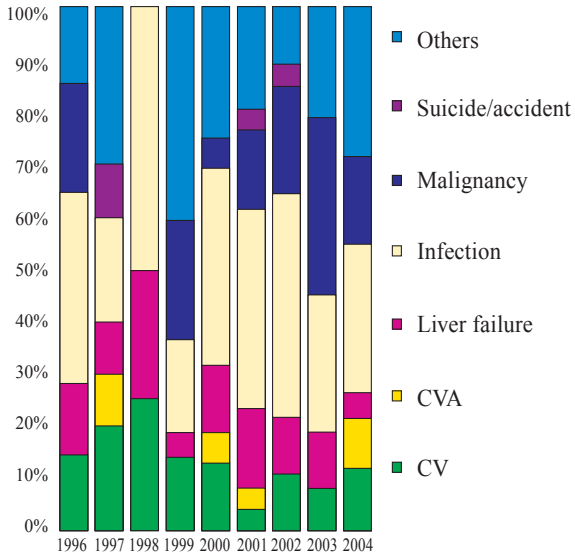


Figure 26. Percentage trends in causes of death in renal transplant recipients (years ending 31 March, 1996–2004). CVA = cerebrovascular accident; CV = cardiovascular disease.

for patients on PD.

During the same period, the overall 1-year patient-survival rate for all modes of HD treatment was 85.6%, and the 5-year survival rate was 55.3%. The majority of patients commenced HD after PD technique failure. This may account for the relatively low 5-year survival rate.

Renal transplant patients

For living related kidney transplants performed in Hong Kong between 1 April 1997 and 31 March 2003, 1- and 5-year patient survival rates were 98.6% and 96.5%, respectively. Graft survival rates at 1 and 5 years were 91.1% and 86.1% (death censored), and 90.5% and 85.6% (death not censored).

For cadaveric kidney transplants performed in Hong Kong between 1 April 1997 and 31 March 2003, 1- and 5-year patient survival rates were 96.1% and 91.2%, respectively. Graft survival rates at 1 and 5 years were 92.5% and 84.4% (death censored), and 91.0% and 81.7% (death not censored).

The 5-year patient survival rates for HBV-positive and HCV-positive patients were 88.2% and 89.4%, respectively; these rates were lower than the overall survival rates for renal transplant patients.

Peritonitis rates

The overall rate of peritonitis associated with all chronic PD systems, for the year ending 31 March 2004, was

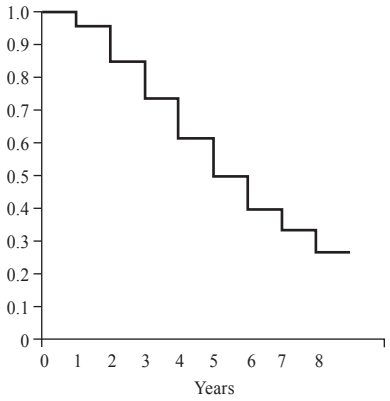


Figure 27. Life table plot of overall survival in peritoneal dialysis patients.

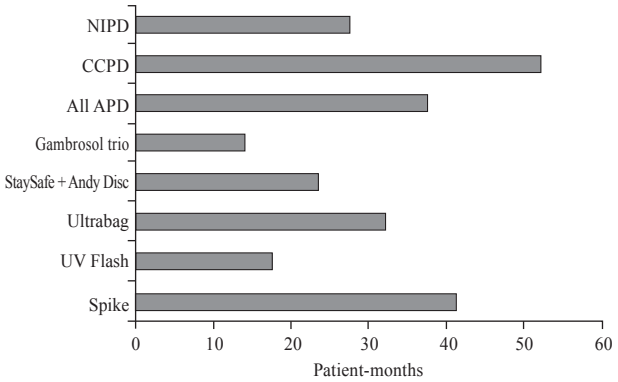


Figure 28. Peritonitis rates (patient-months/episode) for different connecting systems (for the year ending 31 March 2004). NIPD = night intermittent peritoneal dialysis; CCPD = continuous cyclic peritoneal dialysis; APD = automated peritoneal dialysis.

one episode per 27.7 months. The rates of peritonitis varied with different systems (Figure 28): Baxter spike system, 1 in 41.3 patient-months; Baxter Ultrabag®, 1 in 32.3 patient-months; Baxter UV Flash™, 1 in 17.8 patient-months; Fresenius StaySafe device and A.N.D.Y. Disc, 1 in 23.4 patient-months; Gambrosol Trio, 1 in 14.2 patient-months; and APD, 1 in 37.6 patient-months. The rate of peritonitis with the Baxter spike system was exceptionally good in the year ending 31 March 2004. This might explain why some patients surviving with the Spike System are reluctant to change to the disconnect systems that are commonly used nowadays.

Discussion

Most of the ESRD patients in Hong Kong commenced RRT with PD; indeed, most patients received CAPD. Over the period of analysis (1996–2004), the number of patients receiving PD increased, although the rate of growth declined in the most recent years. The introduction of more physiologic solutions and the use of non-glucose-based solutions are important for maintaining health in CAPD patients. Expansion of the capacity for managing HD patients is also required in Hong Kong to cope with the increasing demands of dialysis support for HD programs. Growth in the transplant population was also significant in the past 5 years, and the efficient use of resources and introduction of new immunosuppressive agents are essential in the maintenance of this increasing pool of transplant patients. The increasing number of new diabetic patients reflects the increasing prevalence of diabetes in the general population. Thus, improved management of diabetic patients, and prevention of renal failure in the first place, should be major clinical goals.

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